

Utilization of Trawl By-catch for the Development of Surimi and Surimi-based Products (1979—1987)

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Introduction

Recognising the need to improve the post-harvest technology of the fishing industry in the Southeast Asian region, the 8th Council Meeting of SEAFDEC in 1975 recommended that the Marine Fisheries Research Department (MFRD) in Singapore undertakes a programme on fisheries post-harvest technology. The Japanese Government was requested to send a survey team headed by Dr K Amano to the member countries to identify the status and problems of the fishing industry in the region, with specific emphasis on post-harvest activities. One of the recommendations of the two study tours conducted by the team was the need for more efficient utilisation of the trawl by-catch for human consumption. The MFRD then set up facilities and activities for work in fishery post-harvest technology and initiated a project on trawl by-catch utilisation, initially to assess the suitability of the resources as raw materials for making popular traditional products.

Research and Development

With the increase in landings of small demersal fish (by-catch) in the region, the problem of using this low market value fish resource for human consumption was of immediate concern for MFRD. A project was initiated in 1979 to investigate the use of this resource as a raw material for the production of comminuted products, which included the production of frozen surimi, and the development of a range of fish jelly products.

Production of frozen surimi

The research carried out included developing a processing method based on the adaptation of existing technology and identifying suitable equipment for small-scale and large-scale production (Tan *et al* 1981). The research also included the introduction of several basic technological concepts.

- a) Leaching of the fish mince. This is a most important step in the production of surimi; washing eliminates the components that interfere with gel-formation and makes it possible to utilise not only a wider range of fish species but also raw materials that are not so fresh. Cheap and abundant fish species can now be processed into fresh or frozen mince for the production of good quality fish-jelly products.
- b) Use of sugar as a cryoprotective agent. Experiments were conducted to determine the shelf-life of surimi made from by-catch with varying amounts of sugar. The results indicate that the use of 5% cane sugar was enough to maintain a shelf-life of 6 months at -20°C. This was also suitable in terms of reduced sweet taste as compared with Japanese surimi.
- c) Gel-forming ability studies of the various species of the by-catch (Poon *et al* 1981). This led to better sorting of the by-catch.
- d) Methods to assess the quality of surimi and fish jelly products. This included the use of a Fudoh penetrometer and development of sensory organoleptic assessment techniques.

Fish jelly products

The fish jelly product industry in the region is traditional and is based on the production of fish ball and fish cakes for the noodle and other "fast-food" stalls. The MFRD promoted the concept of producing a wider range of products using frozen surimi. This included the following studies:-

- a) Production of a wide range of fish jelly products both manually and with machines.

- b) Setting the product at higher temperature (40°C/20-30 min) to reduce production time
- c) Introducing machinery for a wide range of products eg *chikuwa* forming machine, mini-fish cake forming machines, fish roll forming machines etc.

Transfer of technology

By 1980, the MFRD began to transfer the technology developed to the fish processing industry. This involved conducting training and demonstration courses designed to popularise and transfer the technology developed. The transfer of technology was directed towards 3 categories of personnel.

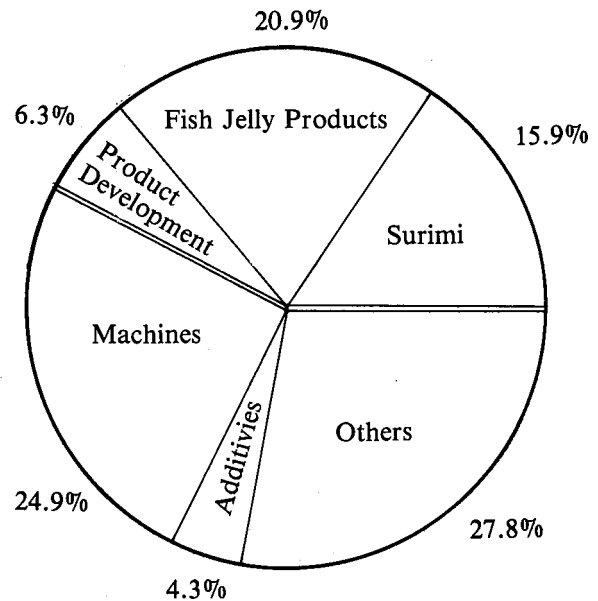
- a) Fish processors in Southeast Asia, interested in the production of surimi and mince meat. This involved conducting training and demonstration courses on the processing methods, including visits to their factories to assist in production trials, consultation and advice on machinery and processing techniques, assessment of their products etc.
- b) Fish jelly product manufacturers interested in the use of surimi for the production of fish jelly products. Processing trials were conducted with the manufacturers in MFRD, to help screen processes and equipment. However, training and consultation also included demonstration on production of surimi, use of surimi for manufacture of a wide range of products, processing control and equipment.
- c) Fisheries extension and research officers. The training courses were of a more technical nature which included principles and practices of surimi production and fish jelly product manufacture.

Table 1 gives a list of the training courses conducted and the number of participants from 1980-1987.

In addition to training and demonstration courses, the MFRD maintains close relationship with fish processors through extension activities. This has provided opportunities to monitor changes in the industry. Processors are aware of the well-equipped facilities and responsiveness of the staff and many have visited and used the facilities at their own expense in addition to those who are sponsored by sponsored by SEAFDEC.

Figure 1 shows the extension activities carried out by staff of MFRD from 1980 to 1986. Inquiries raised during visits to factories and by processors visiting the MFRD include questions on surimi, fish jelly products, product development, machinery etc. These inquiries were from processors mainly from Malaysia, Singapore, Thailand and Indonesia, who are keen to produce better and more varieties of quality products, as well as to upgrade their production technology, methods and techniques.

Fig. 1
Extension Activities of SEAFEDC/MFRD
(1980—1986)



Results

Since MFRD introduced the use of surimi in the region there has been increasing interest in the industry on both the production and use of surimi in the region.

The number of surimi factories in Thailand is on the increase, at present there being nine factories producing surimi mainly for export to Japan but also to Singapore. Most of the surimi manufacturers have participated in the MFRD's activities.

In 1980, Singapore imported only about 0.5 tonnes of surimi, used mainly by the restaurants. This increased to more than 1500 tonnes in 1986 and there are now many factories producing fish balls and fish cakes us-

**Table 1. Training courses conducted by MFRD and no. of participants
(1980 — 1987)**

Training Course	No. of courses	Country							Total
		Malaysia	Philippines	Thailand	Singapore	Brunei	Indonesia	Others	
1) Short-Term Training Course in Post-Harvest Technology	13	20	18	23	14	2	17	(3)*	94 (3)
2) Regional Lecture/ Demonstration Course for Fish Processors and Technologists	7	26 (8)	33	37 (6)	(5)	0	11 (1)	(2)**	107 (22)
3) Lecture-cum-Demonstration Course for Local Fish Processors	4	NIL	NIL	NIL	113	NIL	NIL	NIL	113
4) Short-Term Training Course for Fisheries Technicians	2	6	0	0	0	0	0	0	6
5) Special Fellowship in Fishery Post-Harvest Technology	2	0	0	2	0	0	0	0	2
6) <i>AdHoc</i> Training Course for Fish Processors	2	4	0	5	0	0	0	0	9
Total	30	56 (8)	51	67 (6)	127 (5)	2	28 (1)	(5)	331 (25)

*1 Sri Lankan and 2 New Zealanders

**1 from AQD/SEAFDEC and 1 from FAO (Bangkok)

() = observers

ing surimi. There are also about 4-5 importers of frozen surimi, mainly from Thailand.

Whilst it may not be economically viable for Singapore manufacturers to produce surimi, most of the fish jelly product manufacturers have now incorporated the leaching step into their manufacturing process. This has not only resulted in better quality products, in terms of gel-strength and appearance but also enabled them to use a large number of species including those which previously gave products of unacceptable quality.

Due to its instability, fresh minced meat could not be distributed over long distance and are often of poor quality by the time it reaches the end-users (fish ball-fish cake manufacturers in Singapore). With the incorporation of the leaching process, fish suppliers in Southern Malaysia and Thailand now produce chilled leached meat and maintain its quality for a longer period (2-3 days). This has resulted in better utilisation of the cheap and abundant fish species in the region.

In the late 70s and early 80s the local fish jelly product industry was being resettled as part of Singapore's development programme.

MFRD quickened the pace through the introduction of new technology (use of surimi, leaching process, double-step heating at 40-45°C etc). Of particular interest to the manufacturers was the identification and introduction of suitable equipment to mechanise certain aspects of the production of fish balls and fish cakes when the cost of labour was rising rapidly. The MFRD has now establish good rapport with the manufacturers who now come regularly to the Department for advice and consultation.

In addition MFRD has also prepared a handbook, "The Processing of Frozen Surimi and Fish Jelly Products in Southeast Asia" for processors in the region. This handbook will serve as a reference guide and will further assist the industry's development.

Poon K.H., Lim P.Y., Ng M.C. and Ng P.C. 1981. Suitability of leached meat of small demersal fish for making fish jelly products. Singapore Journal of Primary Industry 9(1): 28-37.

Tan S.M., T. Fujiwara, Ng M.C. and Tan C.E. 1981. Processing of By-catch into frozen minced blocks (surimi) and jelly products. In 'Fish By-catch — bonus from the Sea'. Report of a Technical Consultation on Shrimp By-catch Utilisation, Georgetown, Guyana, FAO/JDRC: 89-92.